What is claimed is:

1. A data acquisition node supporting acquisition of data, the apparatus comprising:

multiple circuit boards that, when interconnected, form a rigid assembly of successively stacked circuit boards, at least one circuit board and a corresponding adjacent circuit board in the rigid assembly including connector interfaces to directly and electrically couple the at least one circuit board to the corresponding adjacent circuit board in the rigid assembly;

a housing that slidably receives the rigid assembly of successively stacked circuit boards; and

the rigid assembly of successively stacked circuit boards including a power circuit board operable to provide power to at least one other circuit board in the rigid assembly.

2. A data acquisition node as in claim 1, wherein the housing includes slots for slidably receiving edges of circuit boards in the rigid assembly.

3. A data acquisition node as in claim 2, wherein the edges of the circuit boards in the rigid assembly include heat sink regions that supports thermal conduction between the rigid assembly and the housing.

4. A data acquisition node as in claim 3, wherein at least one of the heat sink regions includes:

multiple patches of electrically conductive material disposed on separate layers of a corresponding circuit board of the rigid assembly.

5. A data acquisition node as in claim 1, wherein the rigid assembly of stacked circuit boards includes:

a first circuit board including a network interface circuit supporting communication over a network link;

a second circuit board including an input interface circuit operable to acquire data associated with signals received from an external source with respect to the data acquisition node; and

a processor board disposed between the first circuit board and the second circuit board, the processor board i) receiving the acquired data from the second circuit board, and ii) initiating communication of the acquired data through the network interface over the network link.

6. A data acquisition node as in claim 1, wherein the rigid assembly of successively stacked circuit boards further includes a network interface circuit supporting communication of acquired data over a network.

7. A data acquisition node as in claim 1, wherein the rigid assembly of successively stacked circuit boards further includes:

i) an input interface circuit operable to acquire data associated with signals received from an external source with respect to the data acquisition node; and

ii) a network interface circuit supporting communication of the data over a network.

8. A data acquisition node as in claim 1, wherein the power circuit board provides power to all circuit boards in the rigid assembly of successively stacked circuit boards.

9. A data acquisition node as in claim 1, wherein the power circuit board includes a first power connector for receiving an input power signal and a second connector for daisy-chaining power to other downstream data acquisition nodes.

10. A data acquisition node as in claim 9, wherein the power circuit board provides power to all other circuit boards in the rigid assembly of successively stacked circuit boards.

11. A data acquisition node as in claim 1, wherein the power circuit board includes a voltage converter for converting a primary power signal received from an external power source into a secondary power signal distributed to other circuit boards in the rigid assembly.

12. A data acquisition node as in claim 1, wherein the housing is an expandable housing including a first section and second section, each of the first section of housing and the second section of housing including slots on interior walls for slidably receiving edges of circuit boards in the rigid assembly.

13. A data acquisition node as in claim 1, wherein the data acquisition node is an expandable housing including attachable sections.

14. A data acquisition node as in claim 1, wherein the rigid assembly of successively stacked circuit boards further includes a network interface circuit including a first communication port supporting upstream communication to a controller and a second communication port to support downstream communication with other data acquisition nodes.

15. A data acquisition node as in claim 14, wherein the network interface circuit, for a first received data packet at the data acquisition node, forwards the first received data packet to a processing layer of the rigid assembly to learn an address associated with the data acquisition node.

16. A data acquisition node as in claim 15, wherein the network interface circuit selectively forwards a second data packet received at the first communication port to the processing layer if the second data packet has an address corresponding to the data acquisition node, the network interface circuit otherwise forwarding the second data packet downstream through the second communication port.

17. A data acquisition node as in claim 15, wherein a data packet received over the first communication port from the central controller includes address information identifying to which of multiple data acquisition nodes the data packet is directed, the data packet further including address information identifying to which of multiple circuit boards in a corresponding data acquisition node that the data packet is directed.

18. A data acquisition node as in claim 17, wherein the network interface includes a network interface controller that utilizes address information in the received data packet to determine whether to forward the data packet through the second communication port to another data acquisition node or forward the data packet within the rigid assembly to a processing layer that, in turn, forwards information in the data packet to at least one circuit board in the rigid assembly.

19. A data acquisition node as in claim 15, wherein the network interface includes a network interface controller that utilizes address information in other received data packets to determine whether to forward the other data packets through the second communication port to another data acquisition node or forward the data packet within the rigid assembly to a processing layer that, in turn, forwards information in the other data packets to circuit boards in the rigid assembly.

20. A data acquisition node as in claim 1, wherein the rigid assembly of successively stacked circuit boards further includes a signal converter circuit and associated data transfer circuit, the signal converter circuit generating digital data based on a signal received from an input device with respect to the data acquisition node, the data transfer circuit supporting transfer of the digital data to a processor device on a circuit board of the rigid assembly.

21. A data acquisition node as in claim 20, wherein opto-couplers isolate the signal converter circuit from the data transfer circuit.

22. A data acquisition node as in claim 20, wherein a clock associated with the data transfer circuit is disabled when the signal converter circuit converts the signal into the digital data.

23. A data acquisition node as in claim 1, wherein at least two circuit boards in the rigid assembly each include a programmable interface providing access to multiple signal paths common to the at least two circuit boards, the multiple signal paths supporting conveyance of synchronization signals among the multiple circuit boards.

24. A data acquisition node as in claim 1, wherein the rigid assembly includes a network interface for receiving communications over a network from a source, the communications being used to synchronize the data acquisition node with other data acquisition nodes in the network.

25. A data acquisition node as in claim 24, wherein the communications received over the network include a time stamp to synchronize the data acquisition node with the other data acquisition nodes in the network.

26. A data acquisition node as in claim 1, wherein the rigid assembly of successively stacked circuit boards further includes a network interface circuit supporting communication of acquired data over a network; and

wherein the power circuit board provides power to all circuit boards in the rigid assembly of successively stacked circuit boards.

27. A data acquisition node as in claim 26, wherein the power circuit board includes a first power connector for receiving an input power signal and a second connector for daisy-chaining power to other data acquisition nodes.

28. A data acquisition node as in claim 1, wherein the rigid assembly of successively stacked circuit boards further includes a network interface circuit including a first

communication port supporting upstream communication to a controller and a second communication port to support downstream communication with other data acquisition nodes; and

wherein the rigid assembly of successively stacked circuit boards further includes a signal converter circuit and associated data transfer circuit, the signal converter circuit generating digital data based on a signal received from an input device with respect to the data acquisition node, the data transfer circuit supporting transfer of the digital data to a processor device on a circuit board of the rigid assembly, the processor device initiating communication of the data to at least one of the controller and the other data acquisition nodes.

29. A data acquisition node as in claim 28, wherein at least two circuit boards in the rigid assembly each include corresponding programmable interfaces providing access to multiple signal paths common to the at least two circuit boards, the multiple signal paths supporting conveyance of synchronization signals among the multiple circuit boards.

30. A data acquisition node as in claim 29, wherein the power circuit board provides power to all circuit boards in the rigid assembly of successively stacked circuit boards; and

wherein the power circuit board includes a first power connector for receiving an input power signal and a second connector for daisy-chaining power to other data acquisition nodes.

31. A system supporting acquisition of data, the system comprising:

a first data acquisition node;

a second data acquisition node;

a central controller in communication with the first acquisition node and the second acquisition node via a network connection; and

the first data acquisition node and second data acquisition node each comprising:

multiple circuit boards that, when interconnected, form a rigid assembly of successively stacked circuit boards, at least one circuit board and a next successive circuit board in the rigid assembly including corresponding connector interfaces to directly and electrically couple the at least one circuit board to the next successive circuit board in the rigid assembly;

a housing that slidably receives the rigid assembly of successively stacked circuit boards; and

the rigid assembly of successively stacked circuit boards including a power circuit board operable to provide power to at least one other circuit board in the rigid assembly.

32. A system as in claim 31, wherein the first data acquisition node and second data acquisition node support near real-time acquisition of data from sensors, the data being forwarded to the central controller from the first data acquisition node and second data acquisition node over the network connection.

33. A system as in claim 32, wherein the rigid assembly of successively stacked circuit boards further includes a network interface circuit including a first communication port supporting upstream communication to the central controller and a second communication port to support downstream communication with other data acquisition nodes.

34. An apparatus for performing data acquisition from at least one target device, the apparatus comprising:

a plurality of circuit boards arranged in a stacked configuration, each circuit board including at least one interface connection directly coupling at least one interface connection of an adjacent circuit board in the stacked configuration;

a housing configured to receive and maintain the plurality of circuit boards arranged in a stacked configuration; and

the plurality of circuit boards including:

at least one core circuit board containing at least one network interface;

at least one power supply interface configured to allow daisy-chaining of power and network connections to the apparatus; and

a plurality of i/o circuit boards, each configured to acquire data from the at least one target device.

35. A data acquisition node comprising:

a first circuit board supporting communications over a network;

a second circuit board coupled to at least one of:

i) an input device, and

ii) an output device;

a connector interface coupling multiple conductors of the first circuit board to the second circuit board; and

the first circuit board including a corresponding first programmable interface coupled to the multiple conductors, the second circuit board including a corresponding second programmable interface coupled to the multiple conductors, configuration settings of the first programmable interface and the second programmable interface enabling conveyance of signals between the first circuit board and second circuit board.

36. A data acquisition node as in claim 35, wherein the input device is a sensor device that monitors characteristics of a specific region in proximity to the data acquisition node.

37. A data acquisition node as in claim 36, wherein the second circuit board forwards data acquired from the sensor device to the first circuit board for transmission over the network.

38. A data acquisition node as in claim 37, wherein the second circuit board includes an isolation circuit between the sensor device and the corresponding second programmable interface.

39. A data acquisition node as in claim 35, wherein the output device is activated based on commands received over the network.

40. A data acquisition node as in claim 35, wherein the first circuit board includes a first communication supporting upstream communications and a second communication port to support downstream communications.

41. A data acquisition node as in claim 40, wherein the upstream communications include communications to a central controller and the downstream communications include communications to other data acquisition nodes in a data acquisition and control system.

42. A data acquisition node as in claim 35, wherein at least a portion of the multiple conductors supports synchronization between the first circuit board and the second circuit board.

43. A data acquisition node as in claim 42, wherein the first circuit board receives communications over the network indicating how to program the first programmable interface and the second programmable interface.

44. A data acquisition node as in claim 35, wherein the first circuit board and corresponding first programmable interface, based on communications over the network from a remotely located controller, drives a signal to the second circuit board via at least one of the multiple conductors to synchronize the controller with functionality of the second circuit board.

45. A data acquisition node as in claim 35, wherein the second circuit board and corresponding second programmable interface, based on events detected by the input device, drives a signal to the first circuit board via at least one of the multiple conductors to synchronize functionality of the second circuit board with a remotely located controller over the network.